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greater than 105% of reference torque, but both are not greater than these values.

Subpart G—Data Analysis and Calculations

§ 1065.601 Overview.

This subpart describes how to use the responses on the analyzers and other meters to calculate final gram per kilowatt-hour emission rates.

NOTE: Volume and density values used in these calculations are generally corrected to standard conditions of 20°C and 101.3 kPa.)

§ 1065.605 Required records.

Retain the following information for each test:

- (a) Test number.
- (b) System or device tested (brief description).
- (c) Date and time of day for each part of the test schedule.
- (d) Test results.
- (e) Operator's name.
- (f) Engine: ID number, manufacturer, model year, emission standards, engine family, basic engine description, fuel system, engine code, and idle speed, as applicable.
- (g) Dynamometer: Dynamometer identification, records to verify compliance with the duty cycle requirements of the test.
- (h) Gas analyzers: Analyzer bench identification, analyzer ranges, recordings of analyzer output during zero, span, and sample readings.
- (i) Recorder charts: Test number, date, identification, operator's name, and identification of the measurements recorded.
- (j) Test cell barometric pressure, ambient temperature, and humidity as required. (Some test systems may require continuous measurements; others may require a single measurement, or measurements before and after the test.)
- (k) Temperatures: Records to verify compliance with the ambient temperature requirements throughout the test procedure.
- (l) CFV-CVS: Total dilute exhaust volume (V_{mix}) for each phase of the exhaust test.
- (m) PDP-CVS: Test measurements for calculating the total dilute exhaust

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volume (V_{mix}), and the V_{mix} for each phase of the exhaust test.

(n) The humidity of the dilution air.

NOTE: If you do not use conditioning columns, this measurement is not necessary. If you use conditioning columns and take the dilution air from the test cell, you may use the ambient humidity for this measurement.

§ 1065.610 Bag sample analysis.

(a) Zero the analyzers and obtain a stable zero reading. Recheck after tests.

(b) Introduce span gases and set instrument gains. To avoid errors, span and calibrate at the same flow rates used to analyze the test sample. Span gases should have concentrations equal to 75 to 100 percent of full scale. If gain has shifted significantly on the analyzers, check the calibrations. Show actual concentrations on the chart.

(c) Check zeroes; if necessary, repeat the procedure in paragraphs (a) and (b) of this section.

(d) Check flow rates and pressures.

(e) Measure HC, CO, CO₂, and NO_x concentrations of samples.

(f) Check zero and span points. If the difference is greater than 2 percent of full scale, repeat the procedure in paragraphs (a) through (e) of this section.

§ 1065.615 Bag sample calculations.

(a) Calculate the dilution factor. The dilution factor is the ratio of the total volume of the raw exhaust to the total volume of the diluted exhaust. It is calculated as 134,000 divided by the sum of the diluted ppmC concentrations of carbon-containing compounds in the exhaust, as follows:

$$DF = \frac{134,000}{(CO_{2sample} + THC_{sample} + CO_{sample})}$$

Where:

CO_{2sample} and CO_{sample} are expressed as ppm, and THC_{sample} is expressed as ppmC.

(b) Calculate mass emission rates (g/test) for the transient segment using the general equation in paragraph (b)(1) of this section:

(1) The general equation is:

Emission rate = (total dilute exhaust flow volume)(ppm)(density factor)/10⁶

$$M_x = (V_{mix})(C_i)(f_{di})/10^6$$

Where:

M_x = Mass emission rate in g/test segment.

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V_{mix} = Total dilute exhaust flow volume flow in m^3 per test segment corrected to 20°C and 101.3 kPa.

C_i = The concentration of species i , in ppm or ppmC, corrected for background contribution according to the equation in paragraph (b)(2) of this section.

f_{di} = The density factor for species i . The density factors are 576.8 g/m^3 for THC, 1913 g/m^3 for NO_x , and 1164 g/m^3 for CO.

(2) The equation to calculate C_i is:

$$C_i = C_{\text{sample}} - C_{\text{background}} [1 - (1/\text{DF})]$$

Where:

C_{sample} = Concentration of species i in the diluted exhaust sample, in ppm or ppmC.

$C_{\text{background}}$ = Concentration of species i in the dilution air background sample, in ppm or ppmC.

DF = Dilution factor, as calculated in paragraph (a) of this section.

(c) Calculate total brake work (kW-hr) done during the emissions sampling period of each segment or mode.

(d) Calculate emissions in g/kW-hr by dividing the mass emission rate (g/test segment) by the total brake work for the test segment.

(e) Apply deterioration factors or other adjustment factors to the brake-specific emission rate in paragraph (e) as specified in the standard-setting part.

EFFECTIVE DATE NOTE: At 69 FR 39262, June 29, 2004, § 1065.615 was amended by revising paragraphs (c), (d) and (e), effective Aug. 30, 2004. For the convenience of the user, the revised text is set forth as follows:

§ 1065.615 Bag sample calculations.

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(c) Calculate total brake work (kW-hr) done during the emissions sampling period of each segment or mode and then weight it by the applicable test cycle weighting factors.

(d) Calculate emissions in g/kW-hr by dividing the total weighted mass emission rate (g/test) by the total cycle-weighted brake work for the test.

(e) Apply deterioration factors or other adjustment factors to the brake-specific emission rate in paragraph (d) of this section, as specified in the standard-setting part.

§ 1065.620 Continuous sample analysis and calculations.

Use the sample analysis procedures and calculations of 40 CFR part 86, subpart N, for continuous samples.

[69 FR 39262, June 29, 2004]

EFFECTIVE DATE NOTE: At 69 FR 39262, June 29, 2004, § 1065.620 was added to subpart G, effective Aug. 30, 2004.

Subpart H—Particulate Measurements

§ 1065.701 Particulate measurements.

Use the particulate sampling system and procedures specified in 40 CFR part 86, subpart N, to measure particulate emissions from compression-ignition nonroad engines.

[69 FR 39262, June 29, 2004]

EFFECTIVE DATE NOTE: At 69 FR 39262, June 29, 2004, § 1065.701 was added to subpart G, effective Aug. 30, 2004.

Subpart I—Testing With Oxygenated Fuels

§ 1065.801 Applicability.

(a) This subpart applies for testing with oxygenated fuels. Except where specified otherwise in the standard-setting part, compliance with this subpart is not required for fuels that contain less than 25 percent oxygenated compounds by volume. For example, you generally would not need to follow the requirements of this subpart for tests performed using a fuel that was 10 percent ethanol and 90 percent gasoline, but you would need to follow these requirements for tests performed using a fuel that was 85 percent ethanol and 15 percent gasoline.

(b) This subpart specifies sampling procedures and calculations that are different than those used for non-oxygenated fuels. The other test procedures of this part apply for testing with oxygenated fuels.

§ 1065.805 Sampling system.

(a) Use the sampling procedures specified in 40 CFR part 86 for methanol and formaldehyde to measure alcohols and aldehydes in the exhaust. This requires the following:

(1) Bubbling a sample of the exhaust through water to collect the alcohols.

(2) Passing a sample of the exhaust through cartridges impregnated with 2,4-dinitrophenylhydrazine to measure aldehydes.